REVIEW COMMENTS
FEASIBILITY STUDY
881 HILLSIDE

GENERAL COMMENTS:

1. When considering the alternative of encapsulation, the installment of geomembranes should be considered with long term maintenance in mind. What kind of data is available to show the life of such geomembranes? Although this alternative was not preferred, the consideration of such a membrane does not appear to be a long term solution, being that it may not meet the intent of the proposed EPA groundwater standards.

2. The conlusion to eliminate the option of coupling soil flushing with groundwater treatment seems inadequately justified. Although additional soil characterization may be necessary to determine the suitability of the process, the data, as presented in the Feasibility Study, appears to reflect compatable characteristics for a fairly high success in eliminating, if not significantly reducing the VOC's at the 881 Hillside. The additional costs associated with flushing are low, and the need for continuous groundwater treatment may eventually be eliminated. The emphasis here should be for permanent solution to the source problem.

3. Soil removal or partial soil removal may also prove to be less costly when evaluating long term solutions; in that it will eliminate the problem, and therefore reduce associated costs and time for continuous treatment and monitoring of the groundwater.

4. Discussions with Rockwell International indicate that there are datum reflecting the presence of heavy metals. If these measurements are attributable to operations performed on the plant site, it is possible that an ion exchange system may also be required. Additionally, uranium concentrations were encountered, but not further investigated based on statistic probability of contaminant distribution. The sources of these readings are in need of further identification.

General Comments

1) Background soil chemistry must be better defined. Nine upper one foot composite samples are not adequate to define background contaminant applicable to heterogeneous alluvium or bedrock. Without a better (i.e. less conservative) definition of background, detected levels of metals such as mercury, selenium, and strontium should be conservatively interpreted as contamination.

2) Volatile organic compound (VOC) soil gas detection is not always supported by borehole sampling and vice versa. Examples are at SWMU 102 where PCE is detected at soil gas point 106 but not in a borehole 25' away and at SWMU 103 where a detected PCE count of over 68,000 is not supported with nearby borehole detection. There are also numerous instances of high soil gas detection surrounded by grid points with zero detection. The data suggest that either the VOC contaminated areas are isolated spills confined in discontinuous high porosity beds or that detection at the level necessary to define low-level plume fringes is not possible (see comments 14 and 15). While the first case is very likely, discussions should be included concerning the radius of influence expected from passive soil gas counters, analysis variability, and counting thresholds (see comment 14) in order to support the quality of the soil gas data and evaluate its future use on-site, particularly in defining plumes on the small scale.

3) Soil gas detection at the northern perimeter of the 881 Hillside sample area and soil contamination (primarily bis(2-ethylhexyl)phthalate) at boreholes topographically and hydraulically up-gradient of SWMU 119.1 (boreholes BH9-87, BH15-87, and BH8-87) suggest contamination from source(s) above the hillside and just west of the stock piles. The RI should discuss the source of this possible contamination and consider extending boreholes and/or soil gas samples northward.

4) A primary concern with the work done to date at the 881 Hillside is the degree to which the potential for bedrock contamination, both current and future, has been evaluated. The discussion in Section 5.4.2.1 indicates elevated uranium in the uppermost bedrock aquifer at 59-86BR as well as similar groundwater chemistry and selenium concentration to the overlying alluvial groundwater. Considering the proposal to leave waste in place and treat alluvial groundwater, a subcroping sandstone aquifer in the vicinity of Building 881 has a potential for bedrock contamination during the operational life of the treatment facility. Consideration should be given to placing one or two shallow bedrock aquifer wells down-gradient and slightly east of the three well cluster to indicate if suspected bedrock contamination persists down-gradient and down-dip. Also a concentrated geophysical survey combined with a limited number of boreholes in the area bounded by boreholes 59-86BR, BH63-87, BH53-87, and BH3-87 could be implemented to specify the suspected area of bedrock/alluvium communication.

5) The farthest wells down-gradient of SWMUs 102,106, and 107 (3-87BR, 69-86, 59-86BR, 8-87BR, and 2-87) all show semi-volatile and volatile organic contamination and therefore do not bound the contaminant plumes from the area south of Building 881. Although downgradient alluvial wells 68-86 and 53-87 are not contaminated, there is a significant gap (about 1500') between them. Considering the heterogenous composition of the alluvium, an alluvial well between 68-86 and 53-87 would confirm that no further southeasterly contamination has occurred and the plume is contained north of Woman Creek. The same comment applies to the gap between wells 64-86 and 65-86 down-gradient of SWMU 119.1.

Soecific Comments

1) Page 4-8 and Appendix D	The field screening procedure discussed in Appendix D, pages D-10 to D-16, is based on field detection of organics and radionuclides. Given differential retardation of metals versus VOCs, this section should discuss the potential for field screening to miss HSL metals that may persist below the surface composite sample.
2) Page 4-15, first paragraph, third sentence	Table 4-6 indicates two samples near the 903 Pad are elevated in plutonium above background: BH168702CT and BH17870005, not one as discussed.
3) Page 4-21, last paragraph, last sentence	The log of borehole BH4-87 shows the base of a presumably porous sand and gravel at a depth of 15 ft. With this information, the "isolated occurrence" of 4-methyl-2-pentanone is potentially significant as it indicates possible contamination of relatively porous colluvium. This sentence should be rewritten indicating why little significance is placed on this sample.
4) Page 4-27, last sentence in Section 4.5	Volatile organics (2-Butanone) are detected 3 ft into bedrock at well BH3-87 at a concentration of 60 ug/kg.
5) Page 5-26, first paragraph	The statement that a conservative solute would require 80 years to travel to the site boundary is potentially misleading since it does not recognize that much of the solute in the Woman Creek Valley fill will be discharged to Woman Creek thereby leaving the plant boundary well before 80 yrs. This sentence should indicate that this is a conservative estimate for groundwater transport only.

6) Page 5-52, second paragraph	The borehole logs in Appendix A-3 show that well 8-87BR is screened completely through 3 ft of lignite. The ionic constituents of this well are compared to 59-87BR that is completed in an upper sandstone. This paragraph should indicate the differences in lithology and point out why a shift to a sodium-sulfate groundwater can be attributed only to groundwater communication and not a change in bedrock constituents.
7) Page 5-62, summary discussion (5) and last paragraph	While it is probably true that discontinuous gravel lenses contain organic contamination in the horizontal plane near the surface and close to the soil gas detectors, borehole samples indicate vertical contaminant traces well into the claystone bedrock. BH57-87 shows the most prominent bedrock contamination with traces of butanon, TCA, TCE, and TCA detected to a depth of 25 ft, 13 ft into the bedrock. Methylene chloride and acetone were detected at significant concentrations 4 ft into claystone bedrock at BH14-87 and butanon was detected 3 ft into bedrock at BH9-87. The summary discussion should recognize this and indicate that, although bedrock aquifer contamination has not been detected, there is a potential for significant vertical dispersion of these organic constituents and hence contamination of the upper bedrock aquifer.
8) Pages 6-25 - 6-28, Section 6.3	This section should discuss the methods used to collect and analyze sediment. Are these composite samples or surface grab samples? Was the entire sample analyzed or only the clay fraction? Further reference to any techniques cannot be found in this section.
9) Page 9-1, second paragraph	Section 5.4.2.1 discusses elevated uranium concentrations in the uppermost bedrock aquifer at well 59-86BR. This information is omitted in the statement that "uranium contamination appears to be confined to the alluvial groundwater and possibly surface water." This sentence should be rewritten to indicate <u>possible</u> uranium infiltration to the bedrock aquifer.

10) Appendix A, Section 3.1.2.4, last sentence	It is indicated here that soil gas samples were to be taken at increased density to establish plumes detected during initial screening, presumably using the passive soil gas detectors. Why wasn't this done to enhance borehole placement? There are a number of alluvial boreholes that were placed near points of soil gas detection that showed no VOC contamination. A more detailed soil gas survey using a active sampler might have better targeted the center of contamination, particularly for isolated "hot spots" detected near the Building 881 footing drain.
11) Page B-8, Section 3.3	Given the VOC contamination detected at BH9-87 and BH15-87 as well as the potential contamination at the 903 Pad, the location of the background VES point (VES-1 is between the 903 Pad and the contaminated boreholes) was probably not a good one.
12) Page B-19, Section 5.1	There are additional EM-31 anomalies that are not listed or discussed in this section. Areas of elevated conductivity exist at N-34900, E-21580 and N-35080, E-21820 corresponding to contamination at SWMU 119.1. There is also a significant EM-34 vertical dipole anomaly (N-35120, E-20980) under the southeast corner of Building 881. Due to the deeper resolution of the vertical dipole, this anomaly is probably not influenced by the fill material composing the slope on the southeast corner of the building. Also, anomalies cannot be located at N-35120, E-21280 (EM-34 vertical) and N-34940, E-21280 (EM-34 horizontal). The likely locations are probably N-34940, E-21280 and N-34820, E-21100, respectively.
13) Page B-20, Section 5, first paragraph	The anomaly near grid point N-35120, E21280 cannot be found on any of the EM-31 or EM-34 maps. This grid coordinate is actually in SWMU 130 not across SWMU 106, as discussed.

14) Page c-5, Table C-1	Thirteen of the duplicate soil gas samples have zero VOC detection in at least one of the paired filaments. Of these, three zero detections are paired with significant VOC detection (352, 408, and 1,006 counts). Considering detections as low as 107 counts are reported on the maps as significant, the quality of the analysis is in question if nearly 25% of the zero detection filaments are in areas of detectable soil gas concentrations. The variability of the lab analysis and the detection limits should be discussed as they may help explain the sporadic nature of the field samples.
15) Appendix C-2	The soil gas procedures do not address the manner by which excavated soil for sampling tube placement is put back in place and compacted. It would seem that variability in the soil gas counts could be introduced by arbitrary differences in backfill permeability controlling gaseous flux to the sampling tube.
16) Appendix F	What is NR? Not Required? Please indicate as a footnote.
17) Appendix E-3, packer test data for well 4-87	The depth to water column does not correspond to the drawdown information and exceeds the depth of the casing at 19.7 ft.
18) Appendix E-3, bail-down/recovery test data for well 8-87BR	All of the depth to water values after t_0 are below the bottom of the casing at 89.34.
19) Appendix E-3	Data for hydraulic conductivity (slug) tests conducted at wells 2-87, 3-87BR, 4-87, 5-87BR, and 8-87BR are presented without any analysis. A worksheet supporting the hydraulic conductivity calculations should be included that shows all well specific information and empirical coefficients. Assuming the method of Bouwer and Rice (1976) was used, this data should include the values of L, r_w, r_c, D, and the C, A, and B coefficients. Verification calculations using the method of Bouwer and Rice were conducted on the drawdown information provided and were generally within half an order of magnitude of the values given in Table 5-2. Documentation of the parameters discussed above as well as modifications that might have been applied to the method would better support verification.